Evolution of Saturn's G Ring

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Our model of Saturn's G ring is based on its origin from disruption of a small pre-cursor moon. The subsequent evolution of the fragments is followed as in Canup and Esposito (1995). To match the Voyager, Hubble and Keck observations with our steady-state results, we require a progenitor moonlet with radius 1.5-3 km. The resulting mass is distributed in 5 regimes: (1) Large parent bodies too near in mass to accrete; (2) macroscopic bodies in a steady state between the balanced processes of accretion onto the parents and collisional knock-off; (3) smaller particles produced by meteoroid impacts on the parents; (4) a steep distribution of small particles arising from catastrophic fragmentation of larger grains; and (5) the smallest particles, whose distribution reflects the balance between removal due to drag and production by meteoroid bombardment. The combination of these calculated distributions with the Voyager data allows usto set an upper limit on the collision hazard for the Cassini spacecraft to fly through the G ring. This is $\leq$ 1% for models that match the PRA/PWS data.

Abstract submitted for 1996 DPS meeting

Date submitted: LPI electronic form version 5/96

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